such a system of control of imports for a limited period seems preferable to anything in the nature of a permanent tariff. It is not likely to have on the industry the emasculating effect of a protective tariff; provided that the period be limited, and that the licensing committee adopt an enlightened policy, prohibition of imports, except under license, is rather calculated to act as a stimulus on the development of the industry.

There is, finally, one point not dealt with in the proposals outlined above. In return for this shield from danger during a limited period, the country may well ask: What guarantee is there that the manufacturers are taking due measure to promote and prosecute the scientific research and scientific methods on which alone ultimately these, or any other, industries can be made efficient and able to stand against foreign competition? The leading manufacturers have combined to form a scientific instrument research association, and in addition many of them are engaged continuously in scientific reseach. But it is not clear that all the manufacturers who are demanding the legislative measures outlined above are contributing in either or both of these ways to the advancement of the industry. It is worth considering whether the proposed licensing committee should not take this factor into consideration in any specific case in which it is asked to grant or to refuse a license.—*Nature.*

SCIENTIFIC BOOKS

Mineralogy: An Introduction to the Study of Minerals and Crystals. By EDWARD H. KRAUS AND WALTER F. HUNT. McGraw-Hill Book Co., New York. 1920. 561 pages, about 700 figures.

When a new book enters a field supposed to be already rather thoroughly covered, the first thing that will be inquired about it is, wherein does it differ from previous books? A hasty glance through the present volume yields one answer: in the character and quality of the illustrations. The usual line-drawings of crystals are abundantly supplemented by half-tone views of crystal models, which enable the reader to gain an unusually good idea of the shapes of the crystals described. Then there are portraits of leaders in mineralogy and allied sciences, both past and present, and representing various nationalities. And, finally, there are numerous photographs of mineral specimens, bringing out typical features of the 150 mineral species covered.

Other noteworthy features are a readable chapter on the polarizing microscope, one on gems and precious stones, and one in which the minerals are classified according to elements present, and their uses are discussed. The last 150 pages of the book are devoted to an elaborate determinative table, based on physical properties. Every effort has been made to bring out the practical side of the subject, to show wherein the facts given bear on the everyday experiences of the reader, and to make the subject matter interesting as well as informing.

In certain respects, moreover, the book is more up-to-date than is usual in an introductory text. For instance, in the definition of a mineral, allowance is made for recent discoveries as to variability in composition, and for the occurrence of colloid minerals, thus: "A mineral is a substance occurring in nature with a *characteristic* chemical composition, and *usually* possessing a definite crystalline structure. . . ." Further, a table is furnished for the use of the Merwin color screen in identifying elements by flame tests; and special tests to distinguish calcite from aragonite and from dolomite are given. Modernized formulas are listed for pyrrhotite, limonite, and bornite.

The make-up of the book is on the whole good. The crystal models would have shown up better if they had been coated with ammonium chloride before photographing. There are a number of places in which the type has evidently become pied after the last proof was corrected, but these can be readily set right on reprinting. Through a change in the vowel in the last syllable, the birthplace of scientific mineralogy appears as a castle, rather than the more appropriate mountain; microcosmic

salt becomes microscopic in one place; while phosphorus at least three times shows its affinity for o by taking up this letter into its last syllable; but all of these are changes which occur frequently in the composing room, and are of minor importance. The reviewer would prefer the Latin to the hybrid spelling of sulfur, the name columbium to niobium throughout, and diatomaceous to infusorial earth (since there are no infusoria in it). He also does not believe that classification of minerals by their metals is less scientific than by their non-metals; but that every one does not agree on such matters is an advantage to science, and not a detriment to this book.

To sum up: Because of the excellent illustrations, the up-to-dateness, and the practical nature of the information furnished, there would seem to be room for this "Mineralogy" even in a somewhat crowded field.

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SPECIAL ARTICLES

ACID PRODUCTION BY A NEW SULFUR-OXIDIZING BACTERIUM

IN a series of investigations on the oxidation of sulfur, which resulted in the isolation of a very strong sulfur-oxidizing bacterium, a striking fact has presented itself, namely, an intense oxidation of sulfur to sulfuric acid and a large accumulation of acids, even in the absence of neutralizing substances.

The organism is autotrophic, *i.e.*, is able to derive its energy not from the decomposition of organic substances, but from the oxidation of sulfur, although the presence of organic substances is not detrimental to its activities. The carbon, necessary for the building up of its body substances, is derived from carbon dioxide of the air. In a medium entirely free from any traces of organic materials and carbonates and containing ammonium salts as sources of nitrogen and some inorganic minerals, the organism rapidly oxidizes sulfur into sulfuric acid; the latter acts upon neutralizing substances present in the medium (tricalcium-phosphate has been used chiefly) transforming them into salts and acid salts; when all the neutralizing substances present have been used up, free acids begin to accumulate.

Free acidity was measured both by titration, using phenolphthalein as an indicator, and by the determination of the concentration of hydrogen ions, using the phonolsulfonephthalein series of indicators added to buffer solutions. For the determination of the highly acid solutions, tropaeolin 00, methyl-violet and mauvein were used and the results checked up by the electrometric method.

The following table is typical of the acid accumulation by the organism:

TABLE I

Age of Culture	P_H	Titration. C.c. of N/10 Alkali Required to Neutralize 1 C.c. of Culture
At start	5.6	0.16
33 days	2.2	1.25
61 days	1.8	2.25
85 days	0.58	4.00

The titration does not give a true indication of the true acidity of the medium, and, although the culture, when 83 days old, was equivalent to 0.4 N acid by titration, the presence of large amounts of soluble phosphates in the medium would tend to diminish the actual free acids in the medium. But the P_H value gives a true indication of the acid concentration of the medium. The highest concentration of acid ever reported for a living phenomenon was the production of citric acid by *Aspergillus niger,* which reaches a P_H equivalent to 2.0–1.8 (Clark and Lubs[1]). The acidity produced by this sulfur-oxidizing organism, as expressed in terms of P_H—0.58—is greater than that of any acidity ever reported for biologic phenomena.

A detailed study on the sulfur oxidation by this organism will soon be published in *Soil Science.*

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[1] W. M. Clark and H. A. Lubs, *J. Bact.*, 2, 1917, 1–34, 109–136, 191–236.